REMARKS

The Office Action of April 27, 2010 has been carefully reviewed. The Applicants respectfully request the Examiner to reconsider the rejections and allow the pending claims in view of the following remarks.

Claims 1-5 and 7-39 are pending. Claims 6, 28-33 are canceled. Claims 11-27 and 34-39 are withdrawn from consideration. Claims 1-5 and 7-10 stand rejected. Claims 1, 7, 8, 10, 11, and 21 are hereby amended.

Claim Objections

In the Office Action mailed April 27, 2010, the Examiner objected to claim 7. Applicants have amended claim 7 as suggested by the Examiner to overcome this objection.

Claim Rejections – 35 U.S.C. § 112

In the Office Action mailed April 27, 2010, the Examiner rejected claims 1-5 and 7-10 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Particularly, the Examiner suggests that the specification as originally filed does not support the recitation of claim 1 that the prepreg layer is "laminated on at least one whole surface of the upper surface and lower surface. Applicants respectfully submit that that this limitation is supported by the disclosure of the Application as filed, particularly, at Figures 1, 2, and 4.

Additionally, in the Office Action mailed April 27, 2010, the Examiner rejected claims 1-5 and 7-10 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regards as the invention. Particularly, the Examiner suggests that insufficient antecedent

basis is present for limitations recited in claims 1 and 8. Applicants have amended claims 1 and 8 to overcome these rejections.

Claim Rejections – 35 U.S.C. § 103

In the Office Action mailed April 27, 2010, the Examiner rejected claims 1, 5, 7, and 10 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,294,394 issued to Sakai et al. on March 15, 1994 (hereinafter referred to as "Sakai") in view of U.S. Patent Publication No. 2002/0009935 A1 issued to Hsiao on January 24, 2002 (hereinafter referred to as "Hsiao"). In addition, the Examiner rejected claims 2 and 8 under 35 U.S.C. § 103(a) as being unpatentable over Sakai in view of Hsiao and in further view of U.S. Patent Publication No. 2003/0161989 A1 issued to Funakoshi on August 28, 2002 (hereinafter referred to as "Funakoshi"). In addition, the Examiner rejected claims 3 and 9 under 35 U.S.C. § 103(a) as being unpatentable over Sakai in view of Hsiao and in further view of U.S. Patent No. 6,749,934 issued to Nagayama on June 15, 2004 (hereinafter referred to as "Nagayama"). In addition, the Examiner rejected claim 4 under 35 U.S.C. § 103(a) as being unpatentable over Sakai in view of Hsiao and in further view of EP Patent No. 0945253 A2 issued to Bassett et al. on September 29, 1999 (hereinafter referred to as Bassett"). Claims 2-5 and 7-10 depend from independent claim 1 and, as such, stand or fall on the application of the combination of Sakai and Hsiao to independent claim 1.

For the reasons that follow, Applicants respectfully request withdrawal of the pending rejections.

As noted by the United States Supreme Court in *Graham v. John Deere Co. of Kansas City*, an obviousness determination begins with a finding that **"the prior art as a whole in one form or another contains all" of the elements of the claimed invention**.

See Graham v. John Deere Co. of Kansas City, 383 U.S. 1, 22 (U.S. 1966). Applicants respectfully submit that the combination of Sakai and Hsiao (without conceding that such is proper) fails to contain all of the elements of the claimed invention, and therefore cannot render obvious the pending claims. Amended independent claim 1 reads:

> 1. A thermoplastic composite sheet comprising:
> a center layer **prepared by melt-extruding** a thermoplastic composite material containing thermoplastic resin; and
> **a continuous reinforcing fiber-impregnated prepreg layer laminated on at least one whole surface of an upper surface and lower surface of the center layer**, the prepreg layer comprising 5-65% by weight of reinforcing fibers and 35-95% by weight of thermoplastic resin;
> **wherein the continuous reinforcing fiber-impregnated prepreg layer is formed by drawing and pressing fibers passed through an impregnation die supplied with a thermoplastic resin melt in a tape or strand shape, and aligning the fibers in a form of welts and warps**; and
> the center layer of thermoplastic composite material is a foaming layer or a glass fiber-reinforced thermoplastic resin layer.

See supra. No new matter has been added by way of amendment.

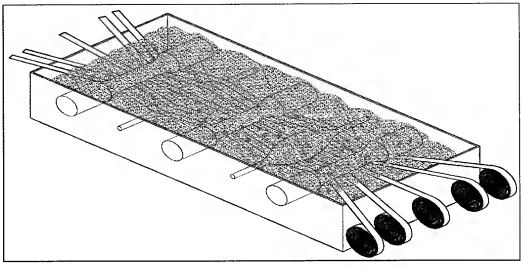
First, Applicants respectfully submit that the combination of Sakai and Hsiao fails to disclose the limitation that ***the continuous reinforcing fiber-impregnated prepreg layer is formed by drawing and pressing fibers passed through an impregnation die supplied with a thermoplastic resin melt in a tape or strand shape and aligning the fibers in a form of welts and warps.*** As shown above, claim 1 recites this limitation. To the contrary, the plate material of Sakai is prepared by a glass mat thermoplastic (GMT) process. In such a process, a GMT sheet is prepared by the method comprising the steps of laminating a glass fiber mat, chopped fibers and thermoplastic polyolefin resin; and melt-compressing the laminate. *See* Application at ¶ [0013].

Sakai teaches a plate material, which the Examiner asserts is comparable to the center layer recited in claim 1, that is made of a thermoplastic resin with a fibrous reinforcement of a glass fiber. Sakai also discloses that the fibrous reinforcement is

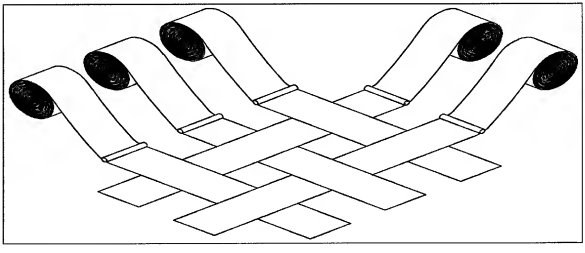
generally used in the form of mat. Sakai at col.2, lines 55-56. Sakai also discloses a preparation method for the plate material in which both top and bottom surfaces of the fibrous reinforcement are continuously overlapped with a thermoplastic resin sheet, successively heated, impregnated with a molten thermoplastic resin, and thereafter cooled to obtain the plate material. *Id.* at col.3, lines 8-14. *See also id.* at col.6, lines 53-62. Thus, it is clear that the plate material of Sakai is prepared by a GMT process. Such method has the drawback that a non-impregnated portion of fibers results. Because the glass fiber mat has cross-sections, it is difficult for the resin to be impregnated to the cross-sections. Thus, Sakai cannot be cited as disclosing the limitation that ***the continuous reinforcing fiber-impregnated prepreg layer is formed by drawing and pressing fibers passed through an impregnation die supplied with a thermoplastic resin melt in a tape or strand shape, and aligning the fibers in a form of welts and warps.***

Further, a thermoplastic composite sheet that is formed by ***drawing and pressing fibers passed through an impregnation die supplied with a thermoplastic resin melt and aligning the fibers in a form of welts and warps*** may exhibit properties superior to those of the plate material of Sakai, as is described in the Specification. *See* Application at ¶ [0037]. For example, a process similar to that recited in claim 1 is illustrated below. Figure 1, below, illustrates ***drawing and pressing fibers passed through an impregnation die supplied with a thermoplastic resin melt***, which may allow the resin to fully impregnate into the fibers. Figure 2, below, illustrates ***aligning the fibers in a form of welts and warps***, for example, the impregnated fibers may be aligned two-dimensionally to prepare the glass fiber mat which has no non-impregnated portion of the fibers.

[Figure 1]



[Figure 2]



Further still, a comparison between Example 1 and Comparative Example 1 and a comparison between Example 2 and Comparative Example 2, which are presented in the Specification, is similar to a comparison between a process in which ***a thermoplastic composite sheet is formed by drawing and pressing fibers passed through an impregnation die supplied with a thermoplastic resin melt and aligning the fibers in a form of welts and warps*** and Sakai in that there is no aligning of the fibers two-dimensionally after impregnating in Sakai's plate material.

According to paragraph [0047] of the Specification, the prepreg of Example 1 the glass fiber was impregnated with thermoplastic polypropylene resin, and then the prepreg sheet was manufactured by weaving the glass fiber.

According to paragraph [0048] of the Specification, the prepreg of Comparative Example 1 was manufactured according to the previously described GMT process. The Specification states "[a] 4 mm-thick composite sheet was manufactured from a mixture of polypropylene-based resin and 40% by weight of glass fibers by the prior GMT process." Application at [0048]. That is, the glass fiber, which has already been aligned two-dimensionally, is simply impregnated with resin. Therefore, there is no aligning of the fibers two-dimensionally after impregnating.

The prepregs obtained from Example 1 and Comparative Example 1 are compared as to bending strength, sheet impact strength, and Izod impact resistance measured according to ASTM D790. The results, shown in Table 2 of the Specification, are summarized as follows:

	Sheet impact crack initiation energy (J)	Sheet impact energy (J)	Bending elastic modulus (kgf/cm^2)	Bending strength (kgf/cm^2)	Izod impact resistance (kgf·cm/cm)	Content of glass fiber (wt%)	Density (g/cc)
Example 1	28±3	42±3	110,000±10,000	2,700±400	135±30	40	1.2
Comparative Example 1	10±3	24±4	52,318±9,250	1,437±424	70±20	42	1.22

As is clear from above, in comparison to Comparative Example 1, Example 1 exhibits significantly superior (nearly twice a great) sheet impact crack initiation energy, sheet impact energy, bending elastic modulus, bending strength, and Izod impact resistance. Furthermore, because the content of glass fiber and density are similar, these differences are attributable to the above-referenced differences in the process.

Furthermore, according to paragraph [0050], the prepreg of Example 2 is substantially the same as in Example 1 with a center layer. Also according to paragraph [0051], Comparative Example 2 is substantially the same as Comparative Example 1 with a center layer.

The prepregs obtained from Example 2 and Comparative Example 2 are compared as to bending strength, sheet impact strength, and Izod impact resistance measured according to ASTM D790. The results, shown in Table 3 of the Specification, are summarized as follows:

	Sheet impact crack initiation energy (J)	Sheet impact energy (J)	Bending elastic modulus (kgf/cm^2)	Bending strength (kgf/cm^2)	Izod impact resistance (kgf·cm/cm)	Content of glass fiber (wt%)	Density (g/cc)
Example 2	28	39	87,000	2,183	100	40	1.2
Comparative Example 2-1	15	31	68,000	2,070	84	42	1.22

As is clear from above, in comparison to Comparative Example 2, Example 2 exhibits superior sheet impact crack initiation energy, sheet impact energy, bending elastic modulus, bending strength and Izod impact resistance. Furthermore, because the content of glass fiber and density are similar, these differences are attributable to the above-referenced differences in the process. Thus, a thermoplastic composite sheet made by ***drawing and pressing fibers passed through an impregnation die supplied with a thermoplastic resin melt and aligning the fibers in a form of welts and warps*** may exhibit superior properties compared to the plate material of Sakai.

In addition, Hsiao describes a fabric impregnated with a polymeric matrix resin composition. *See* Hsiao at [0038]. Hsiao explains that the fabric is prepared by weaving the fabric *and then* impregnating the fabric with a resin composition. *See* Hsiao at ¶

[0110]-[0111]. As such, Hsiao does not align the fibers two-dimensionally *after* impregnating. That is, the method by which Hsaio's fabric is prepared is also a GMT process. As such, Hsiao cannot teach a thermoplastic composite sheet made by ***drawing and pressing fibers passed through an impregnation die supplied with a thermoplastic resin melt and aligning the fibers in a form of welts and warps***. Thus, the combination of Sakai and Hsiao cannot be cited as teaching this limitation. Applicants respectfully request withdrawal of the rejections.

Second, in an effort to further distinguish the instant claims over the combination of Sakai and Hsaio, Applicants have amended claim 1 to further define the center layer recited therein as ***prepared by melt-extruding*** a thermoplastic composite material. Support for this amendment is found in the Specification. *See* Application at ¶ [0018]. Applicants respectfully submit that this amendment will further distinguish the center layer recited by claim 1 from the plate material of Sakai.

In addition, the continuous reinforcing fiber-impregnated prepreg layer has also been amended to further distinguish the claims from a GMT process. Support for the amendment is found in the Specification. *See* Application at ¶ [0037].

Third, Applicants respectfully submit that modification of Sakai to yield the limitation of ***a continuous reinforcing fiber-impregnated prepreg layer laminated on at least one whole surface of an upper surface and lower surface of the center layer*** is inappropriate. The Court of Customs and Patent Appeal, the precursor to the Federal Circuit, held that a *prima facie* case of obviousness cannot be supported if the proposed modification to the prior art would "**change the principle of operation of the prior art invention**." *See In re Ratti*, 123 USPQ 349 (CCPA 1959) (emphasis added). As shown

above, claim 1 recites this limitation. Sakai discloses reinforced strengths **at ribbed portions and narrow sections** on the plate material. Sakai explicitly states:

> it is unfavorable to prepare the **whole** molded article with such resin and fibrous reinforcement, because the portion required to prevent cracks and deformations is only a part of the molded article.

Sakai at column 1, lines 59- 63 (emphasis added). Thus, it is critical to the operation of Sakai's invention that some portions of the plate material be reinforced while other portions of the plate material are not. Therefore, modifying Sakai's plate material to yield ***a continuous reinforcing fiber-impregnated prepreg layer laminated on at least one whole surface of an upper surface and lower surface of the center layer*** would change the principal of operation of Sakai's invention. Thus, such a modification to Sakai's plate material is inappropriate and, as such, Sakai cannot be cited as disclosing this element.

Finally, Applicants have amended claim 10 to remove the term "mono-directional" and claim 21 to remove the term "manufactured." Applicants have amended claim 11 for purposes of rejoinder and claims 28-33 have been canceled.

CONCLUSION

The Applicants respectfully submit that the application, in its present form, is in condition for allowance. If the Examiner has any questions or comments or otherwise feels it would be helpful in expediting the application, the Examiner is encouraged to telephone the undersigned at (972) 731-2288. The Applicants intend this communication to be a complete response to the Office Action mailed April 27, 2010.

The Commissioner is hereby authorized to charge payment of any fee associated with any of the foregoing papers submitted herewith or any fees during the prosecution of the present case to Deposit Account No. 50-1515, Conley Rose, P.C.

Respectfully submitted,

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